

# Overcoming Water Hardness to Improve Pesticide Performance



Water makes up over 90% of most pesticide spray mixtures and it comes from a variety of sources including rivers, lakes, ponds, and wells. The quality of the water from these sources can vary widely in two critical areas: **water pH** and **water hardness**.

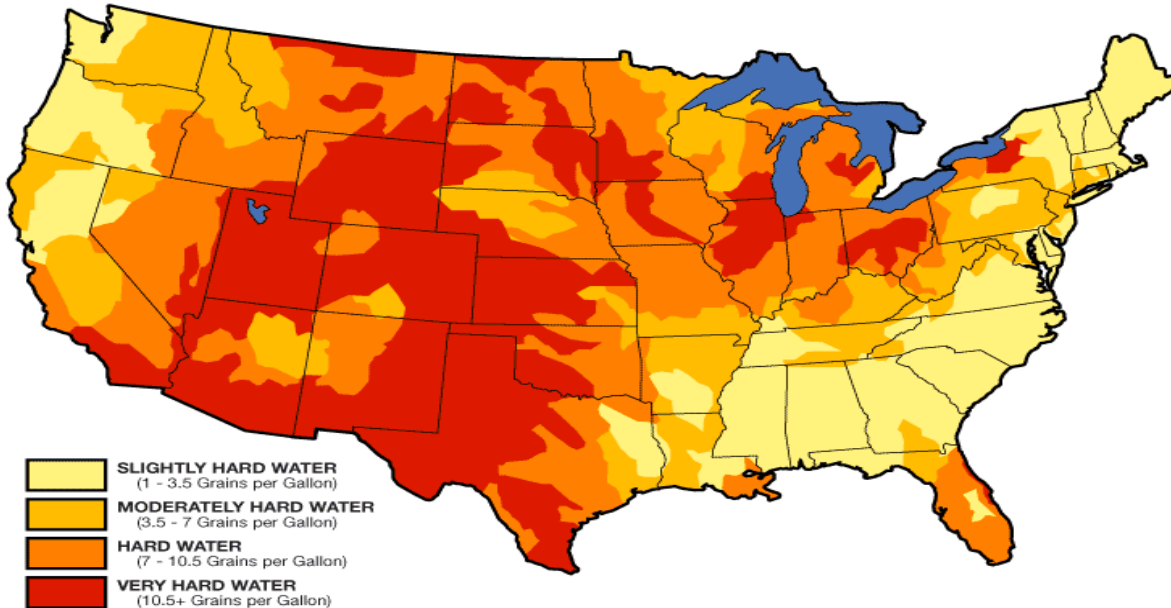
## Water hardness

Water hardness is a measure of the total concentration of positively charged calcium, magnesium, iron, sodium, and aluminum molecules in water in milligrams per liter (mg/l), parts per million (ppm) or grains per gallon (grains/gal). Classification of water hardness ranges from soft water (<17 ppm of dissolved minerals) to very hard water (>180 ppm of dissolved minerals).



WATER HARDNESS SCALE		
Classification	Concentration of dissolved minerals	
	mg/l or ppm	Grains/gal
Soft	<17	<1
Slightly hard	17 to 60	1 to 3.5
Moderately hard	60 to 120	3.5 to 7
Hard	120 to 180	7 to 10.5
Very hard	>180	>10.5

WATER HARDNESS AREAS IN THE UNITED STATES



Adapted from the [United States Geological Survey](https://www.usgs.gov/)

### Facts about hard water

- Hard water can be found in over 85% of US water resources.
- Negatively charged pesticide molecules bind with positively charged molecules in hard water creating molecules which precipitate out of solution, enter target pests at a slow rate, or cannot enter the target pest.
- *AquabupH™ with Nitrogen* helps combat all the hard water cations that negatively affect pesticides.



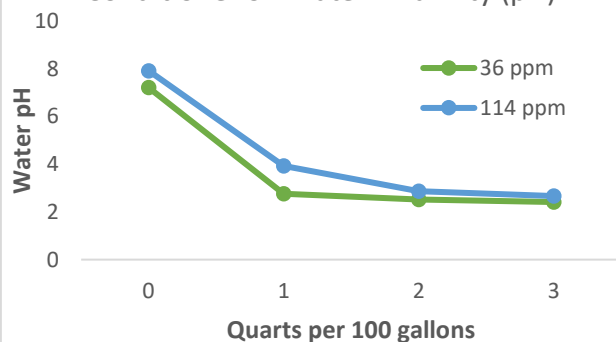
### Water pH

- pH is a value that describes the relative acidity or alkalinity of a solution. The pH scale runs from 0 – 14 where a pH <7 is considered acidic, a pH of 7 is neutral, and a pH >7 is alkaline.
- Most pesticides perform best in water with a pH 4 – 6.5. When the spray solution pH is outside the ideal range, the pesticide will be hydrolyzed and degraded, and will not work as desired.
- *AquabupH™ with Nitrogen* or *Water Conditioner™* can buffer a solution by either lowering or raising the pH of the spray solution and maintaining the pH at a predetermined level for an extended period of time.

### AquabupH™ with Nitrogen

- Nonionic buffering and conditioning agent which contains nitrogen.
- Enhances the uptake of pesticides, particularly herbicides.
- Use rate: 1 – 2 quarts per 100 gallons of slightly hard to hard water. Very hard water may require 3 quarts per 100 gallons.
- Benefits include:
  - Lowers spray solution pH to less than 4.
  - Maintains pesticide spray solution at a low pH for over 8 hours.
  - Chelates iron and sequesters cations in water like calcium and magnesium salts.

Effect of AquabupH and Water Conditioner on Water Alkalinity (pH)



### Water Conditioner™

- Nonionic buffering and conditioning agent.
- Use 1 – 2 quarts per 100 gallons in slightly hard to hard water. Very hard water may require higher rate.
- Benefits include:
  - Lowers spray solution pH to less than 4.
  - Maintains pesticide spray solution at a low pH for over 8 hours.
  - Sequesters cations like iron, calcium, and magnesium salts.